

REMARKS

The Final Office Action of January 28, 2008, has been received and reviewed.

Claims 1-23 and 25-29 are pending and under consideration in the above-referenced application, each standing rejected.

Reconsideration of the above-referenced application is respectfully requested.

Rejections under 35 U.S.C. § 103(a)

Claims 1-23 and 25-29 have been rejected under 35 U.S.C. § 103(a).

There are several requirements in establishing a *prima facie* case of obviousness against the claims of a patent application. All of the limitations of the claim must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 985 (CCPA 1974); *see also* MPEP § 2143.03. Even then, a claim “is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR Int’l Co. v. Teleflex Inc.*, 82 USPQ2d 1396 (2007). The Office must also establish that one of ordinary skill in the art would have had a reasonable expectation of success that the purported modification or combination of reference teachings would have been successful. *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). There must also be “an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR* at 1396. That reason must be found in the prior art, common knowledge, or derived from the nature of the problem itself, and not based on the Applicant’s disclosure. *DyStar Textilfarben GmbH & Co. Deutschland KG v. C. H. Patrick Co.*, 464 F.3d 1356, 1367 (Fed. Cir. 2006). A mere conclusory statement that one of ordinary skill in the art would have been motivated to combine or modify reference teachings will not suffice. *KSR* at 1396.

Tong

Claims 1-8, 19-23, and 25-29 have been rejected under 35 U.S.C. § 103(a) (claim 24 was previously canceled without prejudice or disclaimer) for reciting subject matter that is allegedly anticipated by the subject matter described in U.S. Patent Application Publication 2003/0171456 of Tong et al. (hereinafter “Tong”).

Tong describes a cureable *underfill* encapsulant material for application on semiconductor wafers. *See, e.g.*, paragraph [0013]. The *underfill* encapsulant material described by Tong is a B-stageable composition made up of one or more epoxy resins, an imidazole-anhydride adduct, and at least one solvent. *See, e.g., id.* Tong describes applying and initially curing the *underfill* encapsulant material on a semiconductor wafer. *See, e.g., id.* The temperature and length of the initial cure are important, as they must be tailored to prevent overcuring of the B-stageable composition. Paragraphs [0031] and [0032]. The glass transition temperature (T_g) of the B-stageable material is also very important, as it must be tailored to facilitate clean dicing of the material once the material has been partially cured, or “B-staged.” Paragraph [0033]; TABLE 4. Tong notes that a B-staged material that is “cleanly diced” does not stick to a wafer saw and has no cracks. Paragraph [0033].

Since the B-stageable composition of Tong is formulated for use as an *underfill* material, the teachings of Tong are limited to effecting a final cure only after a semiconductor die has been assembled with and electrically coupled to (by solder reflow) a substrate. *See, e.g.*, paragraphs [0025] and [0026].

Independent claim 1 recites a method for forming a protective layer on a plurality of semiconductor device components. The method of independent claim 1 includes, among other things, subjecting at least the protective material to conditions that will heal cracks and delaminated areas that were formed as the components were severed. After the protective material is subjected to such conditions, and *before* the resulting semiconductor device is assembled with another component of an electronic device, the protective material is fully cured.

It is respectfully submitted that Tong does not support a *prima facie* case of obviousness against independent claim 1. Specifically, it is respectfully submitted that there would be no apparent reason for one of ordinary skill in the art to use and fully cure the *underfill* material of Tong before a semiconductor die on which that material has been disposed is assembled with a substrate. Fully curing that material before assembling the semiconductor die with a substrate would contradict the primary purpose of an underfill material: to seal the space between two structures (*i.e.*, a semiconductor die and a substrate) by merely introducing an encapsulant material between the structures and curing the encapsulant material. If the B-stageable material

of Tong were applied to the surface of a die and fully cured before the die was assembled with and electrically coupled to a substrate, additional processes for sealing the space between the die and the substrate would be required. These additional processes would only serve to unnecessarily complicate the process disclosed in Tong. As such, there would have been no apparent reason for one of ordinary skill in the art to modify the underfill/interconnection process of Tong in the manner that has been asserted by the Office, as is required to establish a *prima facie* case of obviousness.

Moreover, it is respectfully submitted that Tong does not teach or suggest subjecting at least a protective material to conditions that will heal cracks and delaminations produced during semiconductor dicing. Tong merely teaches that the B-stageable material is formulated so as to have a glass transition temperature that allows it to be “cleanly diced” once the material has been B-staged; *i.e.*, that the material will not stick to the dicing saw or crack or break when sawed. Paragraph [0033]. A “cleanly diced” B-staged material would, therefore, include no cracks. Since Tong teaches that there are no cracks or breaks in B-staged material following the dicing process, one of ordinary skill in the art wouldn’t have any reason to expect that there would be any cracks or breaks to heal.

Furthermore, it is respectfully submitted that Tong does not describe circumstances in which healing would occur, or conditions in which healing would inherently occur. Rather, the description of Tong is merely limited to application of a B-stageable material to a semiconductor wafer (*see, e.g.*, paragraph [0013]), partially curing the B-stageable material by removing solvent therefrom (*see, e.g.*, paragraph [0013]), dicing the partially cured material and the wafer (*see, e.g.*, paragraph [0013]), and assembling a semiconductor device that has been coated with the partially cured B-stageable material face-down over a substrate before the B-stageable material is fully cured (paragraphs [0025] and [0026]).

Because Tong does not teach or suggest healing cracks and delaminated areas in a protective material, the teachings of Tong do not support a *prima facie* case of obviousness against independent claim 1.

Therefore, under 35 U.S.C. § 103(a), the subject matter recited in independent claim 1 is allowable over the teachings and suggestions of Tong.

Each of claims 2-8, 19-23, and 25-29 is allowable, among other reasons, for depending either directly or indirectly from claim 1, which is allowable.

Claim 8, which also depends from claim 5, is further allowable since Tong lacks any teaching or suggestion of applying the protective material such that the protective material is spaced apart from a base portion of at least one conductive structure.

Claim 25 is additionally allowable because Tong neither teaches nor suggests singulating semiconductor devices from a fabrication substrate once the material of a protective layer on the semiconductor devices has been singulated, then fully cured.

Claim 28 is further allowable because Tong includes no teaching or suggestion of healing the protective material by heating at least portions of a *thermoplastic material* located over peripheral regions of the adjacent semiconductor device components following severing and at least partially severing.

Withdrawal of the 35 U.S.C. § 102(e) rejections of each of claims 1-8 and 19-29 is respectfully solicited, as is allowance of these claims.

Tong in View of Glenn

Claims 9-18 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in Tong in view of teachings from U.S. Patent 6,650,019 to Glenn et al. (hereinafter “Glenn”).

Claims 9-18 are each allowable, among other reasons, for depending directly or indirectly from claim 1, which is allowable.

It is also respectfully submitted that the teachings of Tong and Glenn do not support a *prima facie* case of obviousness against any of claims 9-18.

In this regard, it is respectfully submitted that, without the benefit of hindsight that the above-referenced application provides to the Office, one of ordinary skill in the art wouldn't have had any reason to expect that teachings from Tong and Glenn could be combined in the asserted manner. This is because, when the teachings of Tong and Glenn are considered in their entireties, as required by M.P.E.P. § 2141.02, the packaged semiconductor devices disclosed in Tong and Glenn are not interchangeable. The teachings of Tong are limited to use of B-stageable

materials as underfill between semiconductor devices that are flip-chip bonded to substrates with solder balls that extend directly between bond pads of the semiconductor device and corresponding terminals of the substrate. *See, e.g.*, paragraphs [0025] and [0026]. The teachings of Glenn are, in contrast, limited to stacked semiconductor device assemblies in which the backside of a semiconductor device is positioned against a substrate and leads electrically connect bond pads of the semiconductor device and correspondence terminals of the substrate. *See, e.g.*, FIGs. 3-8.

For these reasons, it appears that one of ordinary skill in the art wouldn't have been motivated to combined teachings from Tong and Glenn in the asserted manner without the benefit of hindsight provided by the claims and disclosure of the above-referenced application.

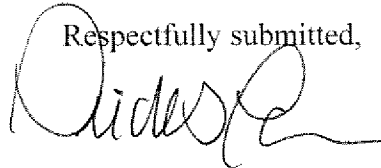
Therefore, is respectfully submitted that the asserted combination of teachings from Tong and Glenn does not support a *prima facie* case of obviousness against any of claims 9-18 of the above-referenced application.

Withdrawal of the 35 U.S.C. § 103(a) rejections of each of claims 9-18 is respectfully solicited, as is the allowance of these claims.

CONCLUSION

It is respectfully submitted that each of claims 1-23 and 25-29 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing allowance of the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Brick G. Power", written over the typed name.

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